

birth upon the cerebellum of certain birds and animals. The rapid Golgi method was used, and the subjects were sparrows, starlings, rabbits, cats and dogs.

The object of the work was to find out whether or not there was any correlation between the development of the power to walk and the histological structure of the brain, and if so to discover the nature of the changes that took place in the nerve centres while the function of walking was being acquired.

According to the author's observations, the power to walk, as gradually acquired, is accompanied by a progressive modification of the Purkinje cells from the pyramidal type of the young to the more fully rounded type of the adult. The external granular layer is also gradually reduced in thickness, thus leading to the conclusion that there is some such correlation as suggested.

The histology of the cerebellum is treated in a number of details bearing upon the subject. The conclusions which the author reaches may be summed up as follows:

(1) The whole of the external granular layer cannot be regarded as an embryonic stage of the molecular substance.

(2) Development takes place in the internal granular layer independent of the animal's increasing ability to stand or walk.

(3) As the locomotor functions are acquired the Purkinje cells and the cells of the deep layers of the granular zone show the most marked and regular development. It is, therefore, concluded that the Purkinje cells are connected with the power of locomotion.

(4) The correlations between anatomy and function which are the most clearly established are those existing between the processes of Purkinje cells and the ramifying plexuses on the one hand and the descending dendrites of the basket cells and the bodies of the Purkinje cells on the other.

JELLIFFE.

THE EFFECTS OF THE LOSS OF SLEEP. By Professor G. T. W. Patrick and Dr. J. Allen Gilbert (Studies from the Psychological Laboratory of the University of Iowa).

These experiments are supposed to be the first of their kind on human subjects. In 1894, at the International Medical Congress, held at Rome, M. de Manacine reported his experiments on young dogs he kept from sleeping and which died from insomnia at the end of the fourth or fifth day. These University of Iowa experiments were conducted upon three instructors under thirty years of age, of good health and habits, who were kept awake continuously for about ninety hours. They were constantly attended by one or two watchers. They took their regular meals at 7 A. M., 12.30 P. M. and 6 P. M., also a light lunch at 12.30 A. M. Their food was normal in character and amount and their time was mostly engaged in reading, games (both light and active), walking, working upon apparatus, and about one-third of the whole time was occupied with the experiment observations, which were taken every six hours and took two hours each time.

Case 1. An assistant professor, aged twenty-eight, single, health perfect, nervous temperament, of great vitality and activity accustomed to eight hours sleep. By the second night he did not feel very well and was very sleepy. The third night he suffered less, but had a hallucination of sight in the form of a greasy-looking molecular layer of rapidly moving or oscillating particles appearing on or near the floor. On the fourth day and evening he felt well. The daily rhythm showed the sleepy periods to be from midnight to noon, but most marked about dawn. The visual hallucination after the second night had gradually changed from being a layer of particles to a swarm of little bodies like gnats, but colored red, purple or black, and did not change with the position of the eye. Meanwhile his vision

was growing acuter until he went to sleep, after which the hallucination had vanished. The subject retired after ninety hours waking and immediately fell asleep, but was hourly roused (to test the depth of his sleep) and each time immediately lapsed into profound sleep. After ten and a half hours sleep he awakened spontaneously, felt wholly refreshed and as well as ever. The following night he slept two hours longer than usual. At the conclusion of the sleep fast the subject had gained twenty-seven ounces in weight, but after his ten and a half hours sleep he had lost thirty-eight ounces in weight. Although acuteness of vision gradually increased up to the time of sleeping, it fell below the normal after sleep. Voluntary motor ability decreased (tested by rapid tapping of the forefinger on a key connected with a recording drum and graphic chronometer). The pulse, which was eighty-eight the first evening, gradually lost until it was sixty-one, the fourth evening, but the pulse, which after fatigue the first evening was eighty-nine, dropped to fifty-two after fatigue on the fourth evening. Sensibility to pain in both upper and lower thresholds, gradually decreased slightly, but returned to the normal on the fourth evening a few hours before sleeping. Memory gradually declined but returned to the normal the last evening, and after sleep it dropped more than two-thirds. Attention gradually waned (as tested by the adding of figures) but was approaching the normal on the fourth evening and after sleep it was fully restored. Grip and pulse slightly decreased. Reaction time somewhat increased and returned to the normal after sleep. His temperature was hardly changed.

Case 2. An instructor, aged twenty-seven, single, quiet, of excellent health and accustomed to nine hours sleep.

Case 3. An instructor, aged twenty-four, single, stout, perfectly healthy and accustomed to eight hours sleep.

Both Cases, 2 and 3, started their sleep-fast at the same time and under the same circumstances and continued it for eighty-eight and one-quarter hours. Unlike Case 1 (which was a preliminary experiment), neither of them experienced any hallucination of vision or any serious suffering. Case 2 was very sleepy the last twenty-four hours. Both slept immediately upon retiring and awoke wholly refreshed, Case 2 after eleven and a quarter hours and Case 3 after fifteen and one-sixth hours. Both subjects gained in weight before sleeping and lost after, or rather during sleep, but, unlike Case 1, their decrease in weight was less than their increase. The observations made were about the same in all cases. According to time measurement Case 2 only found it necessary to make up for sixteen per cent. of his lost sleep; Case 1, twenty-five per cent. and Case 3, thirty-five and three-tenths per cent. It is suggested that this may be accounted for in two ways, viz.: partial sleep during the waking hours or by depth of sleep afterwards. The fact that the subjects all had dreams while awake during the experiments, and the fact also that their sleep was very profound, would indicate that both suppositions accounted for the apparent deficiency. Their urine had an increase of nitrogen and phosphoric acid during the period of insomnia, and relatively more phosphoric acid than nitrogen was excreted. CHRISTISON.

PHYSICAL AND MENTAL MEASUREMENTS OF THE STUDENTS OF COLUMBIA UNIVERSITY. By Prof. J. McKeen Cattell and Dr. Livingston Farrand.

From the Psychological Review, Nov., 1896, pp. 618-648.

The authors state, "their chief object in the present paper is the description and discussion of methods rather than the communication of results," and that their object is to "know how a man, for example, has a large head, a short reaction time or a good memory, is likely to vary from the average in other directions, and how likely he is to vary to a certain extent." In this set of experiments they give the